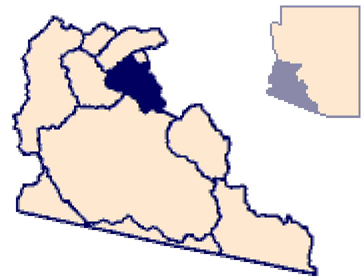
HARQUAHALA BASIN



The Harquahala basin is in west-central Arizona and contains 765 square miles (Figure 15). The basin is a broad northwest-trending alluvial valley surrounded by mountains and is typical of the Basin and Range physiographic province. The valley slopes to the southeast at 15 to 20 feet per mile and is drained by Centennial Wash. Centennial Wash enters the basin at its northwestern end between the Harquahala and Little Harquahala Mountains, and exits the basin in the southeast corner. Centennial Wash and its tributaries are ephemeral and flow only in response to heavy rains in the surrounding mountains. The basin is bounded on the north by the Harquahala Mountains, on the west by the Eagletail and Little Harquahala Mountains, on the south by the Gila Bend Mountains, and on the east by the Big Horn and Saddle Mountains.

Elevations range from 1,000 feet above mean sea level where Centennial Wash exits the basin to over 5,000 feet above mean sea level in the mountains surrounding the basin.

The basin-fill alluvium is the main aquifer in the Harquahala basin. Minor amounts of groundwater occur in the thin veneer of alluvium found in the mountain washes. Groundwater in the alluvium generally is unconfined, however, localized clay layers create some semiconfined to confined conditions. A number of perched water table areas have formed as a result of irrigation water percolating down onto the clay layers. Perched water is most prevelant in the east-central and southeastern parts of the basin where agricultural development is greatest.

Virtually all groundwater pumped from the main aquifer is used for crop irrigation. Water production from wells varies widely because different lithologies are encountered within the basin. Recently measured well-yields range from 350 gallons per minute to 3,000 gallons per minute (Hedley, 1990). The best well-yields are from the alternating sequence of fine-grained and coarse-grained sands in the west-central part of the basin. In the east-central part, wells penetrate the overlying fine-grained sequence and draw water from the underlying coarse-grained sequence. In the southeastern part of the basin, most wells tap the coarse-grained sand and gravel layer.

The amount of groundwater currently available to 1,200 feet below surface level in the Harquahala basin has been calculated to be 15.5 million acre-feet (Arizona Department of Water Resources, 1988). Natural groundwater recharge into the basin is negligible and is estimated to be about 1,000 acre-feet per year (Metzger, 1957; Freethey and Anderson, 1986). Most of the recharge comes from infiltration of runoff through the alluvium in Centennial Wash. Minor amounts of recharge may originate as subsurface flow into the basin from McMullen Valley to the north (Graf, 1980). Due to low precipitation and high evapotranspiration rates, very little direct rainfall recharges the aquifer. A new source of recharge to the basin is infiltration of water from the Central Arizona Project (CAP) canal which runs approximately west to east across the southern part of the basin. Using seepage rates determined by the Central Arizona Water Conservation District, an estimated 5,900 acre-feet of water per year is recharged into the basin by the CAP canal (Arizona Department of Water Resources, 1988).

Before 1951, when groundwater development began in the Harquahala basin, groundwater moved through the basin from the northwest to the southeast and exited where Centennial Wash leaves the basin. By 1957, pumpage had stopped the flow of groundwater out of the basin, and by 1963, three cones of depression had developed in the southeastern part of the basin. The cones intercepted groundwater headed for the outlet and halted the flow out of the basin (Stulik, 1964). Continued pumpage caused the three cones to coalesce into one large cone by 1966 (Denis, 1971). Current groundwater flow is from the basin edges into the cone of depression in the central portion of the valley (Hedley, 1990).

Groundwater development in the Harquahala basin began in 1951, when the first large irrigation well was drilled. In 1954, 33,000 acre-feet of groundwater were pumped from over 20 wells to irrigate 7,000 acres. Groundwater pumpage increased to 200,000 acre-feet of water by 1966, when 120 wells were used to irrigate 39,500 acres of cropland (Denis, 1971). After irrigation peaked in the mid-1960's, groundwater withdrawals declined through the 1970's and into the early 1980's. From 1950 to 1988, an estimated 3.7 million acre-feet of water were withdrawn from the basin (Hedley, 1990). In 1985, delivery of irrigation water began through the Central Arizona Project (CAP) canal; CAP water has since replaced groundwater as the major source of irrigation water. In 1987, 85,000 acre-feet of Central Arizona Project water and 10,000 acre-feet of pumped groundwater were used to irrigate 18,000 acres of cropland (Hedley, 1990).

The massive overdrafting of the basin's regional aquifer from the 1950's through mid-1980's resulted in large water level declines and the formation of the previously mentioned cone of depression. Predevelopment water levels ranged from 17 feet below land surface at the basin's southeastern outlet to 240 feet below land surface along the edges of the basin (Graf, 1980). Current water levels range from 199 feet to 654 feet below surface level (Hedley, 1990). Perched water levels range from 20 to 254 feet below land surface (Hedley, 1990).

Water levels have declined significantly in the southeastern section of the basin where most agricultural development has taken place. Decline rates of as much as 27 feet per year occurred in this area in the early 1960's (Stulik, 1964). The greatest recorded water-level decline in a well was 325 feet from 1950 to 1980 (Hedley, 1990). Water-level declines slowed in the late 1970's and early 1980's as marginally, economical farms went out of business and water withdrawals declined. The introduction of Central Arizona Project water in 1985 drastically reduced groundwater pumpage and has reversed water level declines in many areas. Water-level rises of as much as 70 feet have been recorded in some wells from 1985 to 1989 (Hedley, 1990); however, the basin is still in an overdraft situation because of its very small groundwater recharge rate and the continued pumpage to support irrigation.

Water quality in the basin generally is suitable for irrigation, but high total dissolved solids and fluoride concentrations in some wells require water treatment for human consumption. Total dissolved solids values ranged from 240 to 4,190 milligrams per liter (mg/l), and fluoride concentrations ranged from 0.3 to 20.0 mg/l.